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Perestroyka and US-Soviet S&T Cooperation: Opportunities and Pitfalls

A Research Paper

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A Research Paper

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Perestroyka and US-Soviet S&T Cooperation: Opportunities and Pitfalls

Summary

Information available as of 1 August 1990 was used in this report.

During the past five years, the Gorbachev leadership increasingly has come to recognize the deficiencies of Soviet science and technology and the adverse impact of the USSR's isolation from the world scientific community on Soviet S&T development. Accordingly, the regime has moved ahead with cooperation agreements designed to link the Soviet S&T establishment to the West, particularly the United States. Further progress in this area—which will hinge, in part, on President Gorbachev's ability to press forward with more radical domestic reforms in science and the economy—could give the United States insight into Soviet S&T performance and capabilities and maybe even some influence over Soviet policy. At the same time, the KGB could gain greater opportunities to target US scientists.

Gorbachev has identified S&T progress as a linchpin of his strategy to revitalize the economy, but his efforts to spur Soviet science and technology have failed. With respect to science, he and his advisers have tended to overemphasize the role of the science sector in the USSR's economic modernization. Reflecting a traditional Soviet faith in science as a means to solve social and economic ills, they have looked to the science establishment to make up for the failings of an industrial system hostile to innovation and the assimilation of advanced technologies. Thus far, the Gorbachev leadership has failed to implement the economic reforms that would provide the incentives to sustain technological advance in the production sector.

At the same time, Gorbachev has placed increased emphasis on S&T cooperation with the West to support *perestroyka* and his domestic restructuring program. During the period of detente in the 1970s, Moscow favored more technology-oriented cooperation, restricted Western access to scientists and information that made exchanges one-way streets, and pursued technological assistance from the West as an alternative to internal reform. Under Gorbachev, however, there has been a trend toward greater balance between cooperation in basic science and applied technology, willingness to engage in two-way exchanges of information, and reliance on cooperation with the West as an essential element of S&T progress and the domestic reform process.

Under Gorbachev Moscow has made major strides in revitalizing scientific exchanges with the United States after their decline in the late 1970s and early 1980s. Building on the steady progress achieved during his summit

meetings with President Reagan, Gorbachev has pushed over the past year for closer S&T interaction consistent with his larger effort to integrate the USSR more closely into the world economic system. Moscow's new initiatives include:

- A variety of proposals for cooperation in "big science" projects—from probing outer space to deciphering the genetic code—as well as in more practical areas such as nuclear reactor safety and the management of toxic waste.
- An offer to create a joint "Soviet-American" university with a faculty from both countries on two campuses in or near the respective capitals.
- Proposals for agreements that would allow Soviet organizations to contract out research tasks to US firms and, alternatively, to accept research contracts from US organizations.
- An increase in the numbers of Soviet scientists, engineers, and managers working or training in US high-tech firms, research laboratories, and academic institutions. To garner hard currency, some Soviet institutes are seeking to lease the services of their scientists to US companies.

The Soviet leader almost certainly hopes that the new scientific agreements and economic accords signed at the recent Washington summit with President Bush will impart new impetus to broadening the scope and forms of cooperation.

Looking ahead over the next few years, Moscow is likely to press for new scientific agreements in areas such as conventional (nonnuclear) energy and research on global climate change. In addition, the Soviets will seek to expand the scope of existing bilateral agreements to include such topics as environmental monitoring of the earth by satellites, maternal and child health care, and the development of new pharmaceutical drugs. Where possible, Moscow probably will push the boundaries of cooperation beyond pure theoretical science toward engineering and industrial applications in order to increase the technological and economic benefits of scientific exchanges

Steps taken to expand bilateral cooperation, however, will contribute only slightly to providing the technological modernization needed to boost the Soviet economy and to close the technology gap with the West. Gorbachev understands that progress in these areas will require a radical restructuring of Soviet scientific activity and the mechanisms for incorporating new technology into the economy. Moscow will have to make greater progress with reforms—such as easing travel restrictions, promoting greater *glasnost*, allowing more decentralization and increased competition, and encouraging innovation and entrepreneurship in S&T—if rapid and broad technological advances are to be achieved. Moreover, further reforms also are essential to support and sustain closer S&T cooperation with the West.

Despite Gorbachev's commitment to revitalizing science and hastening technological advance, the Soviet S&T bureaucracy is still replete with individuals resistant to change, and S&T policy over the past year has dropped down on the agenda of a leadership preoccupied with economic deterioration, consumer discontent, and ethnic unrest. The national forum on science held in Moscow in February presumably signaled a renewed effort to press ahead with the S&T reforms needed to ensure both faster technological progress and closer US-Soviet cooperation, but it remains uncertain whether the leadership has the will and ability to implement the needed changes. Moreover, while reforms in the management of science may help Soviet science, they will do little for economic modernization until the economic system itself is radically reformed and becomes less hostile to innovation and new technology

Moscow is concerned that an easing of travel restrictions and more liberalized emigration policies may lead to a "brain drain." According to recent[C] Soviet scientific leaders have expressed concerns that some of the nation's "best and brightest" researchers are leaving to work and study in the West. The defection of numbers of Soviet scientific exchangees could become a greater irritant in the future as more top scientists participate in various cooperative programs

At the same time, increased US-Soviet cooperation will provide the KGB with greater opportunities to target US scientists, Soviet emigres working in American high-tech companies and academe, and joint ventures to gain access to US data and technology.[C]

[C] The relaxation of COCOM controls could make it easier for Moscow to obtain previously restricted technology and allow Soviet intelligence agencies to better concentrate collection efforts on items remaining under COCOM controls

If the pace of *perestroyka* falters, Soviet backsliding with respect to bilateral cooperation is possible. We could then see greater Soviet bureaucratic micromanagement of bilateral exchanges as well as moves away from reciprocal access and exchange of technical data—key stumbling-blocks in past cooperative efforts. Furthermore, S&T cooperation will continue—as in the past—to be vulnerable to swings in overall US-Soviet relations and could become hostage to disrupting political events.

Contents

Scope Note

S&T cooperation covers a wide range of activities ranging from astrophysics research to investigate the origins of the universe to more practical projects to develop technologies for artificial hearts. During the 1970s, the United States and the USSR signed 11 intergovernmental S&T agreements covering areas from transportation and housing to atomic energy and the world ocean. This pattern of cooperation cooled in the late 1970s and early 1980s with the USSR's invasion of Afghanistan, the downturn in US-Soviet relations, and the West's tightening of restrictions on the transfer of technologies of use to the Soviet military

With the unwinding of East-West tensions under Gorbachev, US-Soviet scientific and technical cooperation is gaining new momentum and direction. At the intergovernmental level, Moscow is seeking to expand bilateral agreements, especially in areas of basic scientific research. At the same time, Moscow, more than in the past, has opened the door to Soviet institutes and firms to cooperate with US private-sector organizations, not only to gain access to US technology but also to receive help commercializing its own research and development efforts

This Research Paper examines Gorbachev's attempt to increase S&T cooperation with the United States and its relation to his larger effort to restructure Soviet science and society. It also assesses the prospects and implications of increased cooperation for the United States and the Soviet Union. The paper does not discuss the details of specific intergovernmental agreements, which are described in the Technology Transfer Intelligence Committee's Subcommittee on Exchanges (COMEX) publication, TTIC 89-10006 (Unclassified), December 1989. *US-USSR Scientific and Technical Cooperative Agreements*

Perestroyka and US-Soviet S&T Cooperation: Opportunities and Pitfalls

New Soviet View of S&T Realities

Since Mikhail Gorbachev came to power in 1985, he has vigorously pressed for increased international collaboration in science and technology (S&T) as part of his larger effort to integrate the Soviet Union more closely into the world economy. In public speeches and meetings with Western leaders, he has strongly endorsed expanding scientific exchanges and the sharing of technology and know-how. Behind Gorbachev's efforts to increase S&T cooperation with the United States—and the West more generally—is a heightened leadership perception of the USSR's lag in S&T and the pernicious effects of isolation from the world scientific community and technological mainstream.

USSR's Lag in Science and Technology

In speeches and articles in the Soviet press, Gorbachev and his advisers have expressed the idea that the Soviet Union has missed the global scientific and technological revolution (STR) and ended up "on the rocks." The Soviet leader told a student forum in Moscow last November, for example, that underrating the STR was perhaps the "gravest mistake" made by the Brezhnev leadership. In a *Pravda* article (26 November 1989), Gorbachev charged that the Brezhnev regime's failure to adapt Soviet policy and structure to world S&T trends stranded the USSR in a bygone technological era while Western countries entered a new era of high technology and consumer prosperity. According to Gorbachev, in the early 1970s the leadership postponed a special plenum of the Central Committee aimed at airing issues of the STR. The result, he claimed, was the "burying" of ideas and retarding the processes of change that were coming to a head in all socialist countries. Thus, he observed, "We lost 15 years at the very least."

Although Soviet leaders before Gorbachev were aware that the USSR lagged the West in a number of technology areas, Gorbachev from the beginning appreciated that the USSR's pronounced lag in information technologies—the pivot of the contemporary STR—was a key factor underlying the country's economic woes. Despite his efforts to boost these areas, however, Soviet industry has fallen far short of the planned goal for microelectronics, computers, and telecommunications equipment, and the Soviet Union has fallen even further behind the West in these critical high-tech areas. In a speech to students in November 1989, the Soviet leader acknowledged that the gap in information technologies has widened during his tenure

The Gorbachev leadership also has become increasingly aware that Soviet science lags the West in many areas. Before Gorbachev, the Politburo saw Soviet science as a strength and believed that the main problem impeding S&T progress lay in the economy's lack of receptiveness to technological innovation. Gorbachev initially shared this perception until 1988 when he highlighted problems in basic science at the Party Conference in June. In August 1988, Politburo member Aleksandr Yakovlev acknowledged that the Politburo had been under an "illusion." The leadership now realizes that in basic science, too, stagnation under Brezhnev has taken its toll and that the USSR is trailing the West in several critical areas.

Soviet commentators cite the following indicators as evidence of the USSR's systemic lag in many areas of science:

- *Nobel prizes.* Since World War II, only eight Soviets—but more than 60 Americans—have won the Nobel Prize for achievements in the natural sciences. Of the Soviet prizes, moreover, all were awarded for prewar work or for work done in the early 1950s.

- *Citation index.* Soviet scientific publications generally do not fare well in terms of the citation rate index—the number of references to an article in other publications—the method widely used in world science to judge the importance of a scientist's work. According to Pavel Volobuyev, a leading

Soviet historian of science, this indicator has deliberately been ignored in the USSR "apparently because on the average it is one-eighth to one-sixth as high as in the United States. But two decades ago we lagged behind the Americans only by a factor of two."

- *Major scientific discoveries.* Soviet science has contributed only modestly to the world register of significant discoveries. Of the dozen fundamental elementary particles discovered in recent years, Soviet physicists contributed none. Of the hundreds of other subatomic particles and resonances considered derivatives of the main particles, Soviet scientists can claim the discovery of perhaps 1 or 2 percent. In astronomy they have added little to the knowledge of the origin and development of the universe. In the biological and life sciences, the Soviets have yet to recover from the damaging legacy of "Lysenkoism."[1]

A few prominent scientists—including academicians Roal'd Sagdeyev, Vitaliy Gol'danskiy, and Nikita Moiseyev—have begun to talk openly about a "crisis" in Soviet science

The Gorbachev regime's new concern over the USSR's lag in science and its call for a greater role for the science establishment—particularly the USSR Academy of Sciences—in economic modernization betray an overemphasis on the role of science in technological and industrial progress. An examination of the experience of Japan, South Korea, and other modernizing countries suggests that a strong science sector is not a precondition for technological and economic advances. While progress in basic science can lay the groundwork for advances in technology, the primary responsibility for technology development and utilization lies with industrial authorities. Unfortunately, for the Soviets, Gorbachev has yet made relatively little headway in implementing economic reforms that would provide greater incentives for technological innovation and diffusion in the Soviet production sector. The impact on the economy aside, the Soviet leadership probably perceives that a continued lag in science could threaten the USSR's claim to superpower status

Causes of Lag: Central Control and Isolation

Soviet commentators have identified two main factors contributing to the lag in Soviet science and technology. First and foremost, the administrative-command system that has led to the deterioration of the economy also has stifled scientific creativity and impeded the flow of ideas and information. Excessive bureaucracy and secrecy have rendered the USSR's vast S&T establishment a chained giant, and in the words of one Soviet critic, "Science, like Gulliver, has wound up tied by its hair to hundreds and thousands of pegs of different instructions and decrees.'

Second, as Soviet press commentary has noted increasingly, the USSR's isolation from the world scientific community and Western technology transfer restrictions have had a deleterious effect on Soviet S&T. Restrictions on travel, communication with foreign colleagues, and access to Western S&T literature have kept many Soviet scientists well behind the frontiers of science. The political leadership appears to have come around to the view of leading scientists like Sagdeyev and Yevgeniy Velikhov that international cooperation is essential to S&T advancement while a policy of autarky leads to catastrophe. Statements by key Soviet officials indicate that they view the way out of this situation to lie in both a fundamental restructuring of Soviet science and the closer integration of the USSR into the world economy and S&T mainstream. For example, Politburo member and party economics secretary Nikolay Slyun'kov in February 1990 told a Moscow forum on managing science that "Science, just like society, needs democratization and structural reform." In September 1989, he also told a Central Committee conference on S&T progress, "We need to get away from the consequences of autarky, which has all but isolated us from the world scientific community. Science is international, and we must draw the practical conclusions from that fact.'

[1] Trofim Lysenko (1898-1976) was a quack biologist who rejected Darwinian notions of evolution, claiming that modification acquired by one generation of plants and animals could be passed on to future generations. His pseudoscientific theories won Stalin's and later Khrushchev's support and were enshrined as official Soviet biological doctrine. Lysenko's views and methods poisoned Soviet science—particularly genetics—and agriculture for decades

Gorbachev's Policy of Closer S&T Cooperation With the United States

Under Gorbachev Moscow has made major strides in restoring scientific exchanges with the United States. In the early 1970s the two countries signed 11 bilateral agreements that provided the framework for expanded exchanges in S&T areas. The high point in bilateral cooperation was the rendezvous and docking of the Apollo and Soyuz spacecrafts in 1975. Bilateral cooperation declined during the cooling of political relations in the late 1970s and early 1980s. Capitalizing on the steady progress achieved during his summit meetings with President Reagan, Gorbachev has pressed steadily over the past year for greater S&T collaboration appropriate to a new era of closer US-Soviet relations.

The 1990 Washington summit produced a series of new scientific and other accords. Besides joint statements endorsing increased collaboration on the environment and in the area of nuclear reactor safety, new and revised cooperative agreements were signed on ocean studies and on the peaceful uses of atomic energy. Moscow also has intensified its assault on US restrictions on technology transfer and on the Coordinating Committee on Multilateral Export Controls (COCOM), which it terms "a relic of the Cold War."

In seeking closer S&T colloboration with the United States, Moscow professes different principles and approaches than during detente in the 1970s. More than in the past, the leadership recognizes the close links between domestic and foreign policy, and its approach emphasizes an expanded scope and new forms of cooperation and fewer one-way exchanges.

Recognition of Domestic-Foreign Linkage

Gorbachev and his closest allies in the leadership appear committed to major systemic change in moving the Soviet Union toward a market-oriented economy and political pluralism. They recognize that improvements in East-West relations and the amount of American and Western help will depend on the image Soviets project of themselves as well as their actions in implementing promised economic and political reforms. In a September 1989 press interview, Shevardnadze said, "Our main goal is to create the most favorable external conditions to accomplish internal *perestroyka*." During the heated debate over regime policy at the Central Committee plenum in February 1990, Shevardnadze asserted, "Only through extensive international cooperation will we be able to solve our most acute domestic problems."

This radical course contrasts with the approach under Brezhnev, where domestic change was not the driving force behind detente and cooperative efforts. On the contrary, the Brezhnev regime sought Western assistance, credit, and technology as a means to achieve modernization on the cheap and quiet and to avoid internal reform. In the early 1980s relations cooled in the wake of the Soviet invasion of Afghanistan, and S&T cooperation with the West largely broke down. Other factors behind the breakdown were Moscow's insensitivity to Western concerns over Soviet human rights abuses and its lack of reciprocity in terms of access and information exchange.

The current leadership also has displayed a greater willingness to work together with other nations on common "global" S&T problems such as the environment. As Shevardnadze stated in the Soviet press in November 1989, "Now ecological inactivity and autarky are a part of the past for us. The Soviet Union is confirming in word and deed its readiness for broad international interaction in the area of ecology." At the same time, Moscow recognizes that the USSR's participation in solving global problems can become an important channel for increasing the involvement of its scientists in world science.

Expanded Scope of Exchanges

A growing and increasingly diverse number of Soviet individuals and groups are seeking increased dialogue and engagement with their counterparts in the United States across a widening range of S&T areas. They have tendered proposals for cooperation in new areas such as environmental protection, biomedical ethics, and social aspects of technology—areas in which the

USSR previously had expressed little interest. While some Soviet officials still show keen interest in "big science" cooperative projects—from probing outer space through monitoring the earth by means of remote sensing to deciphering the genetic code—others are focusing on more practical areas such as collaborative efforts in nuclear reactor safety and the management and handling of toxic and radioactive waste. These efforts represent a trend toward cooperation aimed at solving serious domestic problems and supporting efforts to restructure science and the economy.

Influential Soviet officials also are showing increased interest in how S&T policy is organized and managed in the United States with a view toward applying US practices in the USSR. With their own management system discredited, Soviet S&T officials are looking to emulate the American model and methods:

- [ ] Soviet authorities were planning to establish a government bureau—along the lines of the US Office of Technology Assessment—to study the social, economic, and environmental impact of technology in the USSR. [ ] that Soviet leaders now recognize the importance of doing broader technology assessments and abandoning the narrow technocratic approaches used in the past.

- [ ] stated that the USSR is studying the possibility of creating an organization similar in function to the National Science Foundation (NSF). The Soviets appear to be intrigued by several concepts common to NSF such as the competitive aspect of funding research, an open system for research, a system that is project directed, and the notion of peer review.

- [ ] in creating a parliamentary research and analysis arm similar to the US Congressional Research Service. Members of various science-related committees and commissions under the Supreme Soviet have indicated interest in learning about the oversight roles and workings of their counterparts in the US Congress. The recent Moscow forum on science also raised the idea of establishing a Council of S&T Advisers—possibly along the lines of President Bush's new blue-ribbon panel on S&T policy or the Presidential Science Board—under the Soviet executive presidency.

A growing number of Soviet research organizations and high-tech firms have embarked on major efforts with counterparts in the American private sector through joint ventures and other cooperative arrangements. Whereas commercial agreements in the 1970s emphasized the transfer of hardware and technology, the focus of cooperation now spans the innovation process. There is increased Soviet interest in American technological know-how, management technique, training, and, more generally, how S&T works in market economies. Indeed, this enhanced Soviet interest in mastering the conversion of scientific knowledge into technology and use, rather than science itself, has the potential to make a real difference in Soviet S&T capabilities. Some Soviet R&D organizations are seeking to become partners with Western firms. By March 1990, the USSR Academy of Sciences had already entered into 33 joint ventures and was reportedly negotiating an additional 25 agreements.

Underlying this new effort is Moscow's desire not only to gain access to US technology as well as a more sophisticated design and test base—a major deficiency and bottleneck in Soviet S&T—but also to develop and market in the West the results of the USSR's own research and engineering efforts to earn hard currency. Soviet science is being directed away from ivory tower research to practical applications designed to make science more relevant, competitive, and profitable. While the switch of much of Soviet science to self-financing has provided Soviet R&D organizations with powerful new incentives for expanded commercial contact and scientific cooperation with American industry, the economic benefits of these contacts continue to be limited by the slow pace of reforms needed to encourage innovation in Soviet industry.

New Forms of Cooperation

In the past, the Soviets pursued primarily a top-down, centrally directed approach to cooperation. As a result, US-Soviet S&T exchanges became hobbled by bureaucracy and often failed to produce expected benefits. While such an approach is still reflected in broad umbrella intergovernmental agreements (with the imprimatur of the highest authority), joint commissions, and working groups, the Soviets are showing more flexibility and increasingly are moving toward a more bottom-up, decentralized approach—with emphasis on individual projects and direct scientist-to-scientist links—favored by the United States. (C NF)

Articles in the Soviet press indicate that Moscow has gained an appreciation of the importance of informal communications and face-to-face contacts as well as an appreciation of the limits of published materials. Soviet scientists recognize that international meetings and visits to foreign laboratories are particularly valuable for collecting the latest information on advances and trends as well as providing insight about problems and failures—especially in rapidly developing high-tech areas. By contrast, success stories generally dominate printed S&T literature, and delays in publishing make printed information less timely. In the judgment of some Soviet commentators, the USSR's highly centralized technical information system—the world's largest service for translating and abstracting foreign S&T journals—has been a failure because of its excessive focus on published material

In addition, Soviet organizations also are placing increased priority on gaining access—both legally and illegally—to Western electronic data bases and computer links—the latest tools for communication among US and Western scientists. Academician Boris Paton recently complained that the USSR's backwardness in information technology creates an "electronic curtain" separating Soviet scientists from Western computerized S&T data bases.[1]

A number of Soviet organizations are seeking agreements that would allow Soviet scientists to spend more time in the United States. To support this policy, Sagdeyev has argued that Soviet Nobel Prize–winning physicist Petr Kapitsa could not have made his advances in low-temperature physics without his many years at Rutherford's laboratory in the 1920s and 1930s, nor could Nobel Laureat Lev Landau have clarified the nature of liquid helium without his work at Niels Bohr's institute in the 1930s. As part of this effort to develop closer and more permanent contacts with American scientists, the Soviets have begun to explore possibilities of sending increased numbers of scientists, engineers, and managers to work or train in US high-tech firms, research laboratories, and academic institutions. In 1989, according to the Soviet press, nearly 250 scientists from the USSR Academy of Sciences left to take up long-term work assignments of up to five years in the United States.

To garner hard currency, some Soviet institutes are also seeking to lease the services of their scientists to US companies. Some US firms have already agreed to such Soviet offers.

[redacted]

Moscow also has moved to expand bilateral exchanges of undergraduate students.

[redacted] During a trip to the United States in February 1990, Academy of Sciences Vice President Yuriy Osipyan proposed a joint "Soviet-American university" with a faculty from both countries on two campuses, possibly in or near the respective capitals—a proposal he claimed had Gorbachev's

[1] For a detailed look at Soviet efforts in this area, see the forthcoming DI Research Paper [redacted] *Soviet and East European Computer Networking: Prospects for Global Connectivity.*

full support. At the 1990 Washington summit, the two leaders signed an agreement to increase the number of undergraduate exchange students.

A number of Soviet organizations are trying to contract out research tasks to US firms and, alternatively, to accept research contracts from US organizations. During a conversation with

official expressed hope that American and Soviet firms would be able to bid on the other nation's research contracting in the area of conventional energy

that the Academy was looking for opportunities to provide direct unclassified technical support to Western companies and universities to offset its projected losses in government funding.

At the same time, the Soviets are encouraging US scientists to come to work in Soviet institutes and newly formed "international" research centers.

is discussing inviting American and foreign scientists to be members of Soviet scientific councils, peer review panels, and editorial boards.

To better understand US S&T procedures and improve their own management processes, Soviet Government agencies such as the State Committee for Science and Technology, State Committee for the Protection of Nature, and the Academy of Sciences have proposed or are reportedly considering exchanging staffs on a short-term basis with US counterpart organizations. The MFA's new administration for international S&T cooperation also recently requested close and regular consultations with the State Department's Bureau of Oceans and International Environmental and Scientific Affairs. In late 1989, the USSR Academy of Sciences sent the first Academy-designated S&T counselor to a Soviet embassy. Assigned to Washington, the new "Academy counselor" joins the current S&T counselor, designated by the GKNT, and his staff of four or five officers.

Greater Willingness To Share Information

Some Soviets seem to understand that, to obtain the hoped-for benefits from expanded S&T cooperation, the USSR must be more forthcoming with information and access than in the past. Sagdeyev, for one, has attacked the traditional directives given to Soviet scientists attending international meetings "to give a kopeck's worth of information in exchange for a ruble's worth." According to Sagdeyev, "Such shortsighted thinking has hurt Soviet science far more than it has helped." Other Soviets have observed that the path of "hold back and keep out" has led to the "fallback of Soviet science."

The Gorbachev regime seems to be coming around to this view and has taken initial steps to make exchanges less of a one-way street. Over the past year, for example, it has granted US visitors increased access to Soviet R&D facilities—including previously closed organizations. Gorbachev and Shevardnadze in recent public speeches have insisted that, if the USSR wants to be part of the "civilized world" and integrated into the world economic system, it must adopt new rules of engagement and abide by international standards and values.

At the same time, the Soviets have become more willing to discuss questions of intellectual property rights (IPR) and procedures for sharing information on scientific advances and R&D results. The US side has insisted that new and revised intergovernmental agreements with Moscow include provisions to protect intellectual property such as patents, trade secrets, and copyrights. Such provisions were written into the cooperation agreements on transportation (signed in May 1988) and basic sciences (signed in January 1989) as well as the revised intergovernmental agreements on ocean studies and atomic energy at the 1990

Washington summit. Soviet negotiators initially refused to include specific commitments on IPR protection or dates for implementation of protection in the new US-Soviet trade agreement to be signed at the summit meeting. By late April 1990, however, after much effort and US prodding, they agreed to introduce in 1991 draft laws necessary to fulfill their IPR obligations.

The Soviets realize that the lack of Soviet IPR legislation to protect the significant research and development costs involved in creating new products makes US firms reluctant to enter into cooperative ventures. Moreover, protective measures could become increasingly important for Soviet firms and research organizations as they seek to commercialize the results of their own R&D efforts. During a press interview in December 1989, a Soviet legal expert argued for such legislation, quoting Mark Twain's observation that: "... a country without a patent bureau and without firm laws, which protect the rights of inventors, is like a crayfish, which can move only sideways or backwards."

Perestroyka in Soviet Science: Real Key to S&T Progress

While increased cooperation with the United States may yield substantial benefits in selected areas, it probably will have only a marginal impact on the advance of Soviet science and technology as a whole. Gorbachev's statements over the past five years about the necessity for fundamental restructuring indicate he recognizes that internal reforms are essential to boost S&T. *Perestroyka* in science—a revamping of the organizational structure, management system, and research environment plus the improved coupling of science with industry—is the key to faster S&T progress. At the same time, further *perestroyka* in science, society, and the economy will be required to sustain this movement toward closer S&T cooperation with the United States.

The Gorbachev leadership has become increasingly aware of the need for a major restructuring of the scientific sector. At the June 1988 CPSU Conference, General Secretary Gorbachev and others expressed serious concern over the state of Soviet science and argued the need for fundamental reforms. The criticisms and complaints have continued unabated in the Soviet press as the debate over S&T policy has intensified. At the February 1990 Moscow forum on science, Politburo member Slyun'kov delivered a stinging indictment of the organization and management of science, emphasizing that progress in science requires "radical treatment."

Thus far, the focus of *perestroyka* in science has been on creating a more open atmosphere for the exchange of ideas, democratization and decentralization of decisionmaking, rejuvenation of an aging cadre, and organizational, economic, and social measures to unleash scientific creativity and spur innovation. Although only a few measures deal directly with foreign cooperation, domestic reforms already are having and will continue to have an appreciable impact on US-Soviet S&T cooperation

Easing Travel Restrictions

Restrictions on foreign travel by Soviet scientists have been loosened under Gorbachev. Receiving permission to go abroad has become simpler and faster—particularly for Academy scientists. Since July 1989 all decisions on foreign travel by Soviet Academy members, as well as visits by foreign scientists to the USSR at the invitation of the Academy, are settled in its presidium or within the departments, rather than in the Central Committee and other agencies, [redacted] In addition, in November 1989, the USSR Academy of Sciences along with the State Committee for Science and Technology reportedly received permission to issue foreign travel passports for "official business" (including S&T exchanges) on behalf of the USSR Foreign Ministry and to apply directly to foreign embassies and consulates to obtain visas.

As a result, more Soviet scientists are attending international conferences and going abroad. In 1989, more than 2,650 scientists from the USSR Academy of Sciences alone accepted foreign invitations to work or study in the West. The number of Soviets visiting

Growth in Soviet Scientists Visiting the United States Compared With Other Categories of Soviet Visitors, 1987-89

Type of Soviet Visitor (by visa category)	1987	1988	1989
Tourists	5,479	21,512	37,828
Businessmen	2,602	5,829	12,910
S&T Exchangees	3,045	6,726	14,375
Including in high-tech areas deemed potential risk of technology lo	925	1,287	1,775

[ ]

the United States on S&T exchange visas has more than doubled annually over the past two years (see table) and exceeded 14,300 in 1989. Among them were 1,775 scientists in key high-tech areas where there is a potential for technology loss. Although the number of these visiting scientists has not risen as sharply as total Soviet S&T exchangees, the increase is still impressive.[3] Soviet scientists also are staying abroad for longer periods. According to the Soviet press, the number of Soviet scientists visiting the United States for three months or longer increased more than fivefold in 1989 over 1988.

While civilian scientists—including former refuseniks and dissidents—seem to be the main beneficiaries of this relaxation of travel curbs, researchers involved in defense-related work and those with access to classified information have also gained greater freedom to travel abroad. Indeed, Gorbachev in late 1988 personally interceded to allow five prominent Academy of Sciences researchers involved in classified military research to travel to the United States. He found it incomprehensible that scientists "who had dedicated their lives to the defense of the Soviet Union could not be trusted to travel abroad."[ ]

[ ]

[ ] also indicates that over the past year increasing numbers of Soviet scientists who previously worked at defense-industrial R&D facilities and held secret or top-secret clearances have been allowed to emigrate to the West. Some held their jobs and clearances almost right up to the time of their leaving the USSR—a major departure from the long-standing Soviet practice of requiring persons with access to "state secrets" to wait 10 years or more before receiving permission to leave the country.

Impending Soviet legislation could further relax restrictions on foreign travel. Official statements indicate that a new emigration law would allow almost any Soviet citizen wishing to emigrate or travel and work abroad to obtain a foreign passport. Those with access to state secrets will generally be restricted from traveling for a period of five years, but this period could be extended in exceptional cases by a Supreme Soviet commission.

Soviet press commentary reflects a growing concern that the new law could result in a "brain drain" and undermine the USSR's S&T strength as scientists, alienated from life in Soviet institutes, flee to the West for higher salaries, fully equipped labs, and better conditions for professional development. Some Soviets have charged that Western firms already are competing to lure away some of the USSR's most productive scientists.[ ] the directors of two prestigious academy institutes decried the "new openness"—especially the liberalized emigration policies—as conducive to a dangerous brain drain to the West of the nation's "best and brightest." To avert this, one director has proposed setting up an international foundation where Soviet scientists would share their time between work in the USSR and work in the West. He said, "Having them only six months is better than not having them at all" (see inset).

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Soviets Speak Out on the Danger of a "Brain Drain"

Prominent Soviet scientists and science commentators have begun to express alarm over the growing exodus of the country's scientific brainpower resulting from Moscow's easing of restrictions on foreign travel and emigration. The following remarks are taken from speeches at the general meeting of the USSR Academy of Sciences in March 1990 and other recent statements in the Soviet press.

Growing Concern

"The so-called brain drain is a relatively new but already acute problem for the USSR Academy of Sciences. The departure of Soviet scientists abroad for practical scientific training and work has become a natural process, but it is necessary to give serious consideration to ensuring that it is not detrimental to the development of Soviet science." (Academy President Guriy Marchuk)

"If the movement of Soviet scientists to the West continues at the same pace, I fear that there will simply be no one left to work in our institutes and laboratories. And this would be a blow not only to the present but also to the future of the country." (Yuriy Osipyan, Academy vice president and member of Gorbachev's Presidential Council)

"An enormous outflow of the best people abroad is occurring. This is now already a very conspicuous phenomenon. But after a while it threatens to turn into a landslide, which in general will carry away all our basic science." (Academician Aleksey Abrikosov)

"The brain drain could kill all hope of overcoming the USSR's growing S&T lag behind the West." (V. Katasonov, science commentator)

Reasons for Going Abroad

"Our scientists and engineers are interested in emigrating for a variety of reasons. First, they go abroad to improve their material situation. Our scientists are among the world's poorest. . . . A staff member at one of our research institutes, with 15 or 20 years of education under his belt, earns less than a busdriver. Second, there is the 'professional poverty' factor: Soviet science's physical facilities and equipment are very poor by comparison with the West. Third, the overregulation of scientific research—a concrete manifestation of the administrative-command system in the realm of science—'kills' Soviet researchers. Fourth, a whole series of political, religious, and ethnic factors come into play. The increased fanning of ethnic discord in our country in recent years, the growth in political instability, and the fear of civil war are all factors that serve to increase the scale of the brain drain." (V. Katasonov)

"The atmosphere in our society and its attitude toward science and toward the labor and results of scientists give rise to the longing to go abroad." (Ye. Ponarina, journalist)

Recommendations for Stanching the Brain Drain

"Under no circumstances must we cut short the aspiration of our scientists to travel to other countries, because science is international and exchanges of scientists and ideas are absolutely necessary." (Yuriy Osipyan)

"First of all, it is important not to panic. It is necessary to understand that trips of scientists abroad are an absolutely normal process, which is advantageous for the country, and there are not the slightest grounds to hinder it. . . . It is also necessary to create conditions in our own country so that our scientists, having done some work abroad, would willingly return, while Western scientists would aspire to come here." (Academician Vitaliy Goldanskiy)

"It is wrong to conclude that we must return to the 'iron curtain,' since today's problems are precisely its handiwork. It is necessary to get used to the logic of an open society. . . . Yes, we will lose part of our scientific cadre potential by opening up free emigration, but we must work all the harder to ensure that a worthy young generation takes the place of those who have left." (Ye. Novikov, commentator)

KGB Use of Soviet Scientists To Collect S&T Information

The Soviet intelligence services have long used Soviet scientists—particularly those affiliated with the Academy of Sciences—for collection purposes.

almost all Soviet scientists traveling to the West were tasked to some degree to collect S&T information and personal data on Western scientists. By the Soviets' own evaluation, the Academy of Sciences and the State Committee for Science and Technology, along with the State Committee for Foreign Economic Relations, accounted for about 5 percent of the technology acquisitions judged to be most "significant" to their military research projects during this period

indicates that there has been little change under Gorbachev in the KGB's presence at the Academy or in its acquisition efforts and techniques.

KGB officers during these years continued to be assigned to administrative units of the Academy's presidium—including 20 officers to the Foreign Relations Department—and to its institutes. The KGB briefed and debriefed almost all Soviet scientists traveling to the West.

Tasking generally involves requests for specific S&T data—including published materials, preprints, and unclassified papers—elicited from foreign professional contacts. Soviet scientists also are tasked to collect biographic and assessment data on Western counterparts.

the gathering of personal information on high-level foreign scientists was the "main interest" of the institute's deputy director for security, a KGB general.

under Gorbachev scientists who are allowed to travel abroad also are now given "propaganda messages," for use in conversations with Westerners, whose responses they must also report. *was obliged to initiate conversations on the impact of perestroyka in Estonia*

Traveling Soviet scientists sometimes are asked to obtain Western equipment and software but are generally not tasked to acquire controlled technology.

On occasion, however, Academy scientists have attempted to obtain controlled hardware during recent visits to the West *the KGB in 1988 was actively recruiting scientists at the Estonian Academy's Institute of Cybernetics to act as intermediaries in the acquisition of Western communications security technology*

institute personnel agreed to cooperate with the KGB in hopes of obtaining hard currency with which to buy additional computer equipment to support other projects

Apparently most Soviet scientists have been willing to act as intelligence collectors for materialistic, professional, and patriotic reasons. The opportunity to travel to the West provides a powerful incentive. *that "travel was usually implicitly, if not explicitly, contingent upon cooperation." In addition, such travel is career-enhancing and often directly helps the Soviet scientist's own work and advancement. Such cooperation might be diminished if, as a result of perestroyka, travel opportunities and professional careers become less dependent on the KGB*

While procedures for obtaining foreign travel permits have been simplified for Soviet scientists, the USSR Committee for State Security (KGB) remains centrally involved in the approval process, although perhaps not as extensively [redacted] permission to go abroad apparently no longer requires the active approval of the KGB. Before 1988, the process of obtaining approval required an interview with the KGB. Now, the director of the institute is reportedly responsible for approving foreign travel and vouching for a scientist's reliability. The director provides the KGB with a copy of a travel application. However, unless the KGB objects, approval is automatic. This simplification of procedure in processing foreign travel permits notwithstanding, [redacted] the KGB continues to use traveling Soviet scientists to collect S&T information and provide personality and vulnerability assessments on Western scientists (see inset)

Greater *Glasnost*

Glasnost or openness in science has had a noticeable impact on US-Soviet S&T exchanges. Over the past year, the Soviets have granted US visitors increased access to leading scientists and institutes, including some previously off-limits to Westerners. Some scientists have expressed unusual candor in discussing research and development programs, activities, and policies. In general, Soviet researchers have become more open and more willing to admit failures, mistakes, and lack of insight on particular topics as well as to solicit American advice and comments.

To date, however, *glasnost* has spread unevenly in the scientific community. [redacted] indicates that some Soviet scientists are still nervous and reluctant to explain and expose their activities. In general, there is uncertainty and confusion within scientific ranks over *glasnost*. Though many are delighted with the new openness policy, some scientists are uncomfortable with the removal of "rules" to govern interaction or exchange of information with Westerners. Uncertainty about how long *perestroyka* and *glasnost* will last is prompting some Soviets to take advantage of exchange opportunities as quickly as possible, while others are playing it safe. This hesitancy on the part of some Soviet scientists to speak more openly was explained [redacted] as the legacy of decades of secrecy and distrust. He said, "It is not easy to move from a concentration camp to a free society."

At the same time, the regime has not renounced scientific secrecy or the need to protect state secrets. S&T information remains subject to intense censorship. The Soviet legislature has yet to pass new laws that clearly define the rules and limits of *glasnost* in general, much less in science and technology. Soviet scientists—and their contacts with Westerners—continue to come under the watch of Soviet intelligence agencies. The "Foreign Relations Department" within each industrial institute still handles all contacts and coordinates matters through its ministry's foreign relations administration (see inset). In Academy institutes, this component reports to the Foreign Relations Department under the presidium of the Academy. KGB and Soviet military intelligence (GRU) officers continue to head and staff this administrative apparatus:

- At the USSR Academy of Sciences GRU officer Sergey Markianov has been chief of the Academy's foreign relations office since April 1988.

- At the State Committee for Science and Technology (GKNT) KGB general Aleksey Voskoboy has overseen the Main Administration for Scientific and Industrial Cooperation since 1983. He reviews, coordinates, and approves all requests for technology acquisition and for scientific cooperation with other countries.

- Under this GKNT main administration, an Administration for Capitalist and Developing Countries is heavily involved in arranging and monitoring both commercial and intergovernmental S&T agreements with Western countries. Aleksandr Kamenskiy, a KGB officer expelled from France in 1983 for espionage, has headed this administration since late 1988.

Decentralization and Increased Competition

Under *perestroyka*, Academy institutes have also gained authority to enter into collaborative efforts

Monitoring Western Contacts at a Soviet Industrial Institute

[redacted] *has provided a vivid picture of the extensive efforts to monitor and control contacts with Westerners at* [redacted] *Institute* [redacted]

[redacted] *performed some military-related research, it was not a closed organization and Westerners visited it almost on a daily basis. In 1989 the institute received the right to deal directly with foreign firms and no longer had to go through a foreign trade organization. By midyear the institute was in the final stages of concluding a joint-venture arrangement with American and British firms*

Nonetheless, all contacts with Westerners—social visits, phone calls, and mail—continued to be cleared and channeled through the institute's "group for foreign relations," with approval required from the chief of the ministry's foreign relations administration in Moscow. The group published a list of individuals authorized to deal with foreigners. The list was limited to about 15 names

Institute personnel were required to conduct discussions with Westerners in designated rooms, and usually members of the foreign economic department sat in on all negotiations. All phone calls to and from Westerners were strictly controlled. Institute members had to use a special phone to speak with foreigners, and personnel from the "group" remained in the room while conversations were conducted with foreigners. Each call had to be logged in and information provided on with whom one spoke, where, and the reason. The institute had only one outside telephone line, and all incoming calls were received at the group for foreign relations

with Western counterparts without higher approval. Many institute directors and scientists are trying to exploit this new freedom to sign S&T agreements in order to gain increased visibility, travel abroad, meet with US scientists, and obtain computers and equipment for their own facilities

Changes in the Soviet system for financing science—in particular the increased competition for funding among research institutes—also are imparting momentum to increased US-Soviet cooperation. Under mounting pressure to generate their own funding, Soviet scientists are looking to joint research to retain their programs and staff. A number of Soviet science officials have indicated that their programs would be severely pared back if they cannot obtain funding from Western organizations. Joint work is especially important for basic research programs that lack the possibility of generating funding on the expectation of immediate commercial applications. To gain funding, some Soviet scientists are virtually "storming" their US counterparts with cooperation proposals, to use the words of one Soviet academician. He claims that the most sure-fire way for a Soviet researcher to receive government financing is to find an American collaborator

A desire to "get in on the action" of bilateral cooperation is yet another factor behind increased competition within the Soviet scientific community. Scientists in the regional establishments are expressing a growing interest in breaking the monopoly that lead institutes—mostly in Moscow and Leningrad—have long had on contacts with the United States. Republic academies are pressing for more independence from Moscow and greater freedom to determine their own programs and priorities, including collaborative efforts with US scientists and organizations. Soviet scientists increasingly are voicing the view that they will need closer cooperation with US and West European contacts over the next several years in order to be competitive with other Soviet institutes that do. At the same time, efforts by some institute directors to create new monopolies based on East-West cooperation are alienating officials in other institutes.

In sum, *perestroyka* has spawned a host of new grassroots organizations, giving Soviet science and technology an even more "polycentric" basis and form. New scientific unions and professional societies, a federation of engineers, S&T cooperatives, ecology groups, and other "informal" organizations have their

own agendas and concerns and desire greater independence from Moscow and closer links to the world scientific community. These bodies represent potentially new players in the arena of expanding dialogue and cooperation with the United States

Scientific and Technological Entrepreneurship

The switch of Soviet science to more self-financing and measures allowing S&T cooperatives are creating conditions and incentives for scientists and engineers to become entrepreneurs in cooperation with US private-sector organizations. Soviet institute directors are being pushed to commercialize their activities.

Scientists in such leading Academy facilities as the General Physics Institute and the Paton Electric Welding Institute that the message from institute leaders is to move out of research for its own sake and market new technology developments to pay for future research and support their labs.

To raise hard currency, Soviet R&D organizations are offering a variety of products, including atmospheric data, laser glass, and engineered micro-organisms, as well as services, such as the use of oceanographic research vessels and wind tunnels. Even Soviet defense-industrial firms have begun to declassify and market high-technology products developed for defense programs.[4] For its part, the GKNT has created a new department, headed by an expert on "small business," to promote technological entrepreneurship, and in March 1990 it opened a new technology park exhibition in Moscow to help market Soviet technologies in the West.

In a number of cases, Soviet institutes and design bureaus are looking for ventures with US high-tech firms to obtain US assistance in developing practical applications for Soviet research, testing and improving the design of technological prototypes, and marketing Soviet products in the West—all areas where Soviet science and industry are weak. Research institutes are moving away from relationships with Western companies whereby a royalty is paid for use of an institute's technology, to a relationship where the Soviet institute profits as a venture partner

While *perestroyka* has led to the sprouting of a new entrepreneurial spirit, Gorbachev's reforms have not yet created conditions to nourish its growth and development. A firm legal and economic infrastructure supporting and protecting creative people is still lacking. Neither the leadership nor many Soviet institutes and firms have a good grasp of the concepts of entrepreneurship, competition, and free markets. Thus, the new breed of Soviet entrepreneurs emerging on the scene—and their Western partners—face a tough road ahead

Prospects for Increased S&T Cooperation

Barring circumstances that could disrupt US-Soviet relations, Moscow will continue to press to expand the number and scope of bilateral S&T agreements. It probably will push for new cooperative agreements in areas such as conventional (nonnuclear) energy and research on global climate change. In addition, the Soviets will seek to broaden existing agreements to include topics such as environmental monitoring of the earth by satellites, maternal and child health care, and the development of new pharmaceutical drugs. Where possible, they will push the boundaries of cooperation beyond pure theoretical science toward engineering and industrial applications in order to increase the technological and economic benefits of scientific exchanges

Cooperation will be slowed, however, by the sluggish pace of *perestroyka* in science and the delays with domestic reforms designed to support a new round of exchanges and ensure their success. So far, a sluggish Soviet bureaucracy, lack of hard currency, and shortage of Aeroflot flights to the West continue to be obstacles to cooperative opportunities. While global networking is making cooperation much easier to

[4] For more details

arrange and maintain, much "old thinking" continues to permeate central organs managing S&T policy and exchanges. In December 1989, [redacted] that such central organs are incapable of representing Soviet institutes "beyond the Moscow ring road." The Soviet S&T exchange bureaucracy remains largely unchanged at both local and central government levels.

There is growing evidence that the leadership is becoming increasingly concerned about this problem and the need to press ahead with bolder reforms in science and the economy. In July 1989, Academy President Marchuk criticized regime measures during the past four years to restructure science as "half-measures," incapable of pulling science out of the doldrums. The leadership, however, has been slow to take action. Clearly, science and technology matters over the past year have dropped down the leadership's agenda as the Politburo turned most of its attention to crises erupting from continuing economic deterioration, consumer discontent, and ethnic unrest. The February 1990 forum on science presumably signals a new effort by the leadership to get S&T policy and scientific *perestroyka* back on track, but whether the leadership has the attention span, will, and ability to implement the needed changes remains uncertain. Moreover, further reforms in science, even if they improve science, will not result in faster economic progress until the economic system is revamped and Soviet industry becomes less hostile to innovation and new technology.

New Opportunities for the United States

Beyond the direct S&T benefits of bilateral programs, increased contacts and cooperation offer the United States the opportunity to gain access and insight into the USSR's S&T establishment, plans, and personalities as well as influence the reform process—especially the opening and loosening of Soviet science and society [redacted]

[redacted] Moscow's interest in broader dialogue and exchanges across a vast range of areas offers the US opportunity to influence Soviet thinking on issues key to *perestroyka* and to gain access to Soviets who make policy. Soviet officials have asked US officials for advice on such issues as private property (including intellectual property rights), antimonopoly legislation, socioeconomic and technological forecasting, the role of small innovative firms, and the management of science and the science of management—areas essential to the USSR's economic future. Such interchanges provide US officials with opportunities to influence the Soviets' economic and scientific restructuring.

At the same time, the ability of the United States to influence, much less change, Soviet domestic policy and development remains limited. The United States may offer technical assistance and guidance, but the choices and decisions are ultimately Moscow's to make.

Potential Difficulties and Pitfalls

As exchanges intensify, US scientists and organizations will likely be drawn into the internal politics of Soviet science and be used by Soviets to advance personal careers, various public causes, and private schemes:

- [redacted] that future elections to the Academy would depend in large part on international reputation, rather than party reliability. Support from leading scientists in the West thus could weigh heavily in determining who would be elected full academician. Corresponding members of the Academy have already begun to solicit letters of recommendation from US colleagues to bolster their chances of becoming full members.

- Soviet environmentalists are pressing for assistance from the United States in their battle to halt the spread of environmental decay in the USSR[redacted]

[redacted] requested large color US satellite photos of a major flood control project in Leningrad. The small black-and-white aerial photos supplied by Soviet authorities[redacted] did not show the full effects of this billion-ruble project, which he termed an "ecological nightmare."

- [redacted] in the face of strong public distrust of Soviet nuclear technology and policy growing out of the Chernobyl' disaster, have solicited US assistance in certifying the safety of Soviet nuclear reactors and of the construction of reactor sites in terms of local seismological conditions.

[redacted]

In the Kremlin's view, a serious outflow of the USSR's scientific cadre taking advantage of new cooperative opportunities and freedom to travel abroad could become a particularly worrisome factor. A large influx of Soviet scientists to the United States—as emigres or participants in work/study sabbaticals—could exacerbate Soviet concerns over the danger of a "brain drain." The defection of growing numbers of Soviet exchangees would be a further irritant.

The evolving domestic situation in the Soviet Union likely will complicate the conduct and management of bilateral S&T relations in a way frustrating to US participants. The uncertainty and confusion surrounding *perestroyka*, for example, are bound to spill over to cooperative activities. Moscow has raised expectations of less bureaucratic, more open S&T exchanges, but it has not yet implemented the reforms necessary to support and sustain such exchanges. In particular, major institutional barriers continue to impede the flow of information and communication among Soviet scientists—and between Soviet and US scientists—regarding cooperative opportunities and activities. Soviet backsliding with respect to bureaucratic micromanagement as well as issues of access and technical data cannot be ruled out. In addition, the issue of intellectual property protection could become a major stumblingblock in US-Soviet cooperation in the years ahead. The enactment and enforcement of new Soviet legislation—including a long-awaited patent law (see insct)—will be a litmus test of Moscow's ability to lay the groundwork needed for increased bilateral cooperation.

A Changing Soviet Intelligence Threat

Dramatic domestic and global changes pose a challenge to the Soviet intelligence services. With respect to S&T intelligence collection against the United States, these changes will likely complicate some missions and simplify others, and they will demand changes in the Soviet intelligence services' focus and methods. On one hand, the KGB and GRU are probably apprehensive about the implications of expanded cooperation for increased US access to Soviet S&T information and facilities, potential science and technology losses, and possible defections of Soviet scientists. On the other hand, increased cooperation and improved relations enhance Moscow's opportunities for greater access to US S&T information and intelligence. A relaxation of COCOM controls could ease the way to obtain previously restricted technology and allow the KGB to better concentrate collection efforts on sensitive items still on the COCOM list

The Saga of a New Soviet Patent Law

Efforts by the Gorbachev leadership to reform the Soviet Union's patent system—mandated by a June 1985 Central Committee meeting on problems of accelerating S&T progress—have run into difficulties from the very beginning. The long-awaited draft of a new law on inventive activity, for example, reportedly generated stormy debate in the USSR Council of Ministers and was returned three times to the State Committee for Inventions and Discoveries for rewriting before it was made available to the public in late December 1988. Public discussion of the draft, in turn, prompted a good deal of controversy. Despite the Politburo's endorsement in April 1989, the proposed law was killed in committee during the fall 1989 session of the Supreme Soviet

Features of the proposed legislation provoking the sharpest criticism from inventors included the provisions on joint ownership of a patent between the inventor and the enterprise where he works, the lengthy review process, and the issue of compensation. Some critics said that the new law puts the cart before the horse—the problem in increasing the flow of new technology is not a lack of innovations but rather the unwillingness of production enterprises to use these innovations in a timely fashion. Some inventors stated that as long as there is no market for their inventions, most of the law is meaningless and irrelevant.

A substantially revised draft of the new law on inventions was published in the Soviet press in early April 1990 for rediscussion before its submission to the Supreme Soviet, possibly in the fall of 1990. This latest version gives broader property rights and protection to Soviet inventors and rejects the notion of dual patent ownership. It also increases the size of economic rewards to inventors and also economic incentives to production enterprises to use inventions. The law provides patent protection for biological, microbiological, and chemical substances, but not computer software. For the first time, the law details patent rights and provides sanctions, such as monetary damages, for infringement or violations of licensing agreements. A new system of patent courts to review patent infringement cases will also be introduced

The general thrust of these proposed changes would move the USSR closer toward international patent standards and practices. At present, however, Soviet legislation is still in a state of flux, and much controversy continues to surround the subject of property rights—including intellectual property.

The KGB is likely to see increased opportunities for targeting US defense contractors, Soviet emigres, and joint ventures:

- *US defense contractors.* Increased contacts between the US and Soviet military establishments and between their respective defense-industrial complexes provide Soviet intelligence agencies enhanced opportunities for access to US defense contractors and facilities. Soviet defense firms' participation in joint ventures in "civilian" high-tech areas such as aerospace will provide access to US technologies and know-how of use in military programs. The number of Soviet military R&D experts attending international meetings, engaging in informal, direct contacts with US counterparts, and proposing collaborative research projects is also likely to grow.
- *Soviet emigres.* Moscow increasingly is looking to Soviet emigres—including the more than 130,000 who came to the United States between 1971 and 1985—as a source of investment and expertise. A new science commission formed in 1988 under the

USSR Union of Scientific and Engineering Societies to enlist the help of emigres now working in Western high-tech firms, research centers, and universities could become a special target for KGB exploitation and recruitment

At the same time, with Moscow's increasing emphasis on modernizing the economy, KGB collection efforts will give increased attention to technologies with applications to the civilian economy. The focus will also broaden beyond technology hardware into areas of "intellectual transfer," with emphasis on technical data and know-how. Here, the Soviets probably hope to exploit a lack of consensus in the United States about whether controls are appropriate or effective in these areas. Yet, there are also grounds for questioning whether Moscow will derive economic benefits commensurate with the enhanced KGB acquisition efforts. As long as the Soviet system retains its reliance on central planning and its hostility to innovation, the impact of these technology acquisitions will fall far short of Soviet expectations.